of the phototransistor and the high-speed bipolar transistor can be completely implemented on a same substrate; and

wherein the phototransistor and high-speed bipolar transistor structure includes:

a composite collector layer which consists of a collector layer and a photo-absorbing layer, wherein the photo absorbing layer is formed on the collector layer;

a base layer, located on the composite collector layer; and

an emitter layer, formed on the base layer.

21(New). A single-chip structure of SiGe photodetectors and high-speed transistors according to claim 20, wherein the substrate is a silicon wafer or a silicon-on-insulator wafer.

22(New). A single-chip structure of SiGe photodetectors and high-speed transistors according to claim 20, wherein the separated insulation layer is either made by filling a deep trench with an insulation material or using reverse p-n junction to distinctly isolate the photo-detecting zone and the high-speed transistor zone.

23(New). The structure of the phototransistor and high-speed bipolar transistor according to claim 20, wherein the collector layer of the composite collector layer is made of silicon.

24(New). The structure of the phototransistor and high-speed bipolar transistor according to claim 20, wherein the photo-absorbing layer is either a $Si/Si_{1-x}Ge_x$ multiple quantum well or a superlattice, the X range of Ge component in $Si/Si_{1-x}Ge_x$ is defined as $0<X\leq 1$, and possesses an ability to absorb the light spectrum with an infrared wavelength and also improves light absorption efficiency.

25(New). The structure of the phototransistor and high-speed bipolar transistor according to claim 20, wherein the base layer is made of either silicon or silicon germanium, and its thickness is determined by the required speed performance of the high-speed bipolar transistor.

26(New). The structure of the phototransistor and high-speed bipolar transistor according to claim 20, wherein the emitter layer is made of silicon, poly silicon or silicon germanium, and having a thickness as small as 10 nm.

27(New). The structure of the phototransistor and high-speed bipolar transistor according to claim 20, wherein the emitter and collector layers shall be n-type doping, if the base layer is the p-type doping, the emitter and collector layers shall be p-type doping with n-type doping to the base layer, the photo-absorbing layer of the phototransistor is made of an intrinsic (no doping), n-type, or p-type material.

28(New). The structure of the phototransistor and high-speed bipolar transistor according to claim 20, wherein the emitter layer partially or totally covers the base layer.

29(New). A single-chip structure of SiGe photodetectors and high-speed transistors comprising:

a substrate;

a photodiode, which is formed on a side of the substrate;

a high-speed bipolar transistor which is located on the opposite side of the photodiode on substrate; and

a separated insulation layer which separates the photodiode and the high-speed bipolar transistor, consisting o the above components, the photodiode and the high-speed bipolar transistor can be completely implemented by using a single-chip structure;

wherein the photodiode and high-speed bipolar transistor structure includes;

a composite collector layer consists of a collector layer and a photo-absorbing layer, wherein the photo-absorbing layer is formed on the collector layer;

a base layer, formed on the composite collector layer;

an emitter layer, formed on the base layer of the high-speed bipolar transistor, but the photodiode has no emitter layer.

30(New). A single-chip structure of SiGe photodetectors and high-speed transistors according to claim 29, wherein the substrate is a silicon wafer or a silicon-on-insulator wafer.

31(New). A single-chip structure of SiGe photodetectors and high-speed transistors according to claim 29, wherein the separated insulation layer is either made by filling a deep trench with an insulation material or using reverse p-n junction to distinctly isolate the photo-detecting zone and the high-speed transistor zone.

32(New). The structure of the photodiode and high-speed bipolar transistor according to claim 29, wherein the collector layer of the composite collector layer is made from silicon.

33(New). The structure of the photodiode and high-speed bipolar transistor according to claim 29, wherein the photo-absorbing layer is either a $Si/Si_{1-x}Ge_x$ multiple quantum well or a superlattice, the X range of Ge component of $Si_{1-x}Ge_x$ is defined as $0<X\leq 1$, and has an ability to absorb a light spectrum with an infrared wavelength and also improves the light absorption efficiency.

34(New). The structure of the photodiode and high-speed bipolar transistor according to claim 29, wherein the base layer is made of either silicon or silicon-germanium and its thickness is determined by the required speed performance of the high-speed bipolar transistor.

35(New). The structure of the photodiode and high-speed bipolar transistor according to claim 29, wherein the emitter layer of the high-speed bipolar transistor is made of silicon, poly silicon or silicon-germanium and its thickness is as small as 10 nm.

36(New). The structure of the photodiode and high-speed bipolar transistor according to claim 29, wherein the emitter and collector layers are n-type doping, if the

base layer is the p-type doping, oppositely, the emitter and collector layers are p-type doping with n-type doping to the base layer, the photo-absorbing layer of the phototransistor is made of an intrinsic (no doping), n-type, or p-type material.